REMARKS

Claim 1 has been amended to recite that the PEX is crosslinked by a silane grafting process to a gel level of at least 65%. The basis for this amendment can be found in original claims 2 and 5. Claim 10 has also been amended to recite that the PEX is crosslinked with a silane grafting process. Claims 5 and 6 have been cancelled as they are now included in claim 1.

Claims 1-8 and 10 were rejected under 35 U.S.C. §103(a) as being unpatentable over Sadr et al. (U.S. 6,170,535) in view of Nuss (US 6,546,963). This rejection is respectfully traversed as to the amended claims and the Examiner is requested to reconsider.

The reference Sadr et al. is directed to a conduit or fill pipe for an automobile gasoline tank. Sadr uses an electrical conductive inner layer in the conduit, to prevent static electricity buildup. The inner layer of Sadr is made from high density polyethylene (HDPE) having 5-15 wt.% carbon black to make the layer conductive. The outer layer of Sadr's conduit is also either HDPE or Nylon copolymer. Sadr also suggests using a layer of HDPE regrind next to the inner layer and that the first 2 layers comprise at least 50% of the weight of the conduit. Sadr does not suggest using crosslinked polyethylene (PEX) in any of his layers nor does Sadr suggest the specific dimensions of the two layers as required in Applicants' invention.

The thick HDPE layer of Sadr would be too thick to be used as an inner layer in Applicants' pipe and still be sold as a PEX pipe (see dimensional conformance discussion below). Sadr's tube is for an entirely different purpose. It is a non-pressure pipe and it is used at ambient temperature. By contrast, the pipes of Applicants' invention are pressure pipes and must be capable of containing hot water (80°C).

The reference Nuss teaches a composite pipe having a center layer of aluminum. The aluminum layer is coated on both sides with adhesive. The inner and outer layer of Nuss's pipe is PEX.

From the combined teachings of Sadr and Nuss, one skilled in the art would not be inclined to realize that PEX would not be suitable for the inner layer of a pipe transporting water

which has been chlorinated. Applicants show by their specification that a single layer PEX pipe is not nearly as good for oxidative resistance as the lined pipe of the present invention (see Table III). The combined teaching of Sadr and Nuss do not suggest that a thin protective layer of HDPE in a predominately (thick) PEX pipe would protect the PEX layer from attack by chlorine. Sadr does not use PEX at all and Nuss uses PEX in the inner layer thus pointing away from Applicants' invention.

Claim 9 was rejected under 35 U.S.C. 103(a) as being unpatentable over Sadr in view of Nuss and Skarelius (US 4,614,208). This rejection is respectfully traversed and the Examiner is requested to reconsider.

The references Sadr and Nuss were discussed above. The reference Skarelius teaches a gaseous resistant tube which has an inner and outer layer of crosslinked polyethylene (PEX) with a layer of polyvinyl alcohol embedded (with adhesive) between the inner and outer PEX layers. The polyvinyl alcohol layer in Skarelius is used to prevent atmospheric air from entering the water flowing inside the pipe. Since the inner layer of Skarelius' pipe is PEX, Skarelius does not teach the need to protect the PEX from chlorinated water. Claim 9 recites that the oxygen barrier layer is disposed radially outward from the intermediate PEX layer rather than between 2 layers of PEX as taught by Skarelius.

A combined teaching of Sadr, Nuss and Skarelius does not teach the invention claimed in claim 9 of Applicants' invention. Sadr teaches a pipe made entirely of HDPE. An HDPE pipe does not have the required hoop stress for transporting hot (80°C) water. PEX has the required hoop stress (see page 4, lines 2-15, of Applicants' specification). However, PEX is attacked by chlorine in city water. Nuss and Skarelius both teach a pipe which has PEX as the inner layer. This combination points away from Applicants' invention of having a PEX pipe with a thin protective layer of HDPE.

The selection of the thickness of the layers in Applicants' invention is much more than a mere obvious choice of mechanical expedients. Piping standards (ASTM) define how thick the

PEX layer must be in a given pipe, to be called a PEX pipe. This is explained in the Dimensional Conformance section on pages 11 and 12 of Applicants' specification. On page 11, an example is shown for a ¾ inch nominal diameter pipe. The wall thickness of the PEX layer must be at least 0.097 inch (or it cannot be sold as a PEX pipe) and cannot be more than 0.107 inch. This means the maximum thickness of the HDPE layer is 0.010 inch or about 10% of the total wall thickness of the pipe. From a practical point, one could not consistently make a pipe with the minimum wall thickness of PEX and the maximum wall thickness of HDPE. A more practical approach is to allow for some variances in the manufacturing process such that the HDPE layer is targeted for about 5% of the total wall thickness of the pipe.

Applicants have found that by carefully selecting the thickness of the HDPE layer, they can protect the PEX from chlorine while still having a pipe meeting the required hoop stress of a PEX pipe and be marked as a PEX pipe. This was an unobvious finding by Applicants.

Other features in the dependent claims are unobvious as well, such as color coding the outer layer of PEX, when read in combination with the independent claim.

Although the Examiner did not apply a reference cited earlier to the rejection, Applicants' would like to mention U.S. 3,033,238 (Kosewicz) to the Examiner. Kosewicz discloses a polyethylene container, which could be a pipe, having an inner layer of uncrosslinked polyethylene and an outer layer of PEX crosslinked with peroxide. The purpose of using the uncrosslinked polyethylene as the inner layer was to prevent the migration of peroxide into the water. Kosewicz does not disclose using HDPE as the inner layer, but is silent on the type of polyethylene used. The PEX layer of Kosewicz also has "substantial" amounts of carbon black. Kosewicz states that his liner can be of any thickness, but prefers a thickness of 0.025 inch (col. 2, line 17-20). Applicants' liner must be very thin and be within narrow tolerances to meet the requirements of a PEX pipe. It is submitted that the reference Kosewicz does not teach Applicants' invention nor leads one skilled in the art to the pipe claimed by Applicants.

Applicants believe that this rejection has been traversed by the amendments to the claims and by the arguments set forth above. The Examiner is respectfully requested to reconsider and allow the amended claims.

Respectfully submitted,

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Date: March 8, 2006
201TR046AAmd.doc